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Analytical evaluation of energy losses of an air source heat pump water heater

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Abstract content
 (Max 300 words)

Air source heat pump water heater is a renewable and energy efficient device used for sanitary hot water production. The system comprises of two major blocks namely storage tank and heat pump connected by pipes. These blocks can either be compact as in the integrated model or split as in the retro-fit model. ASHP water heater efficiency is primarily governed by its coefficient of performance usually more than 200 % and also depends on the circumstances and climatic conditions under which the system is operating. In this paper, the analysis of energy losses was performed using SIRAC residential split type heat pump of 1.2 kW input power and 240 V single phase as per manufacturer's specification to retrofit a 200 litres high pressure kwikhot storage tank without hot water being drawn off for the entire monitoring period. Likewise to experimentally determine the losses a data acquisition system was designed and built to measure ambient temperature, relative humidity, outlet hot water temperature of the storage tank, inlet cold water and outlet hot water temperatures of the ASHP. Two flow meters were also installed on the inlet cold water pipe of ASHP and on the outlet hot water pipe of storage tank. In addition, electrical power of ASHP was also measured. The results showed that heat gain to compensate stand by losses could range from 1.8 kWh to 2.1 kWh with the corresponding electrical energy used ranging from 0.55 kWh to 0.66 kWh. The stand by losses depend primarily on volume of water heated, ambient temperature and relative humidity while influence of the temperature difference between the hot water and cold water from respective pipes of ASHP is secondary. Finally, we also determined the energy consumed by the micro controller of ASHP to be approximately 0.10 kWh.

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MSc

Main supervisor (name and email)
and his / her institution

Dr Michael Simon
Fort Hare Institute of Technology, University of Fort Hare

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Primary author: Mr TANGWE, Stephen (Fort Hare Institute of Technology, University of Fort Hare)

Co-authors: Prof. MEYER, Edson (Fort Hare Institute of Technology; University of Fort Hare); Dr MICHAEL, Simon (Fort Hare Institute of Technology; University of Fort Hare)

Presenter: Mr TANGWE, Stephen (Fort Hare Institute of Technology, University of Fort Hare)

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